Green Propellant Infusion Mission Program (GPIM)

Completed Technology Project (2012 - 2020)

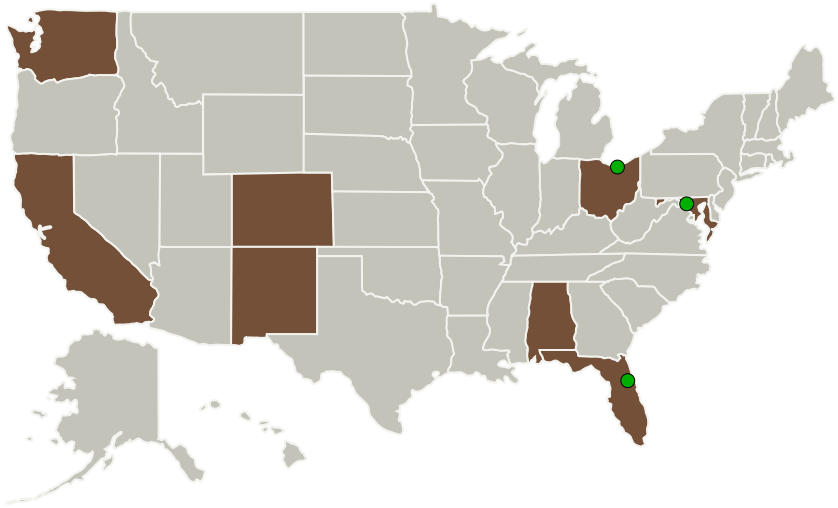
Project Introduction

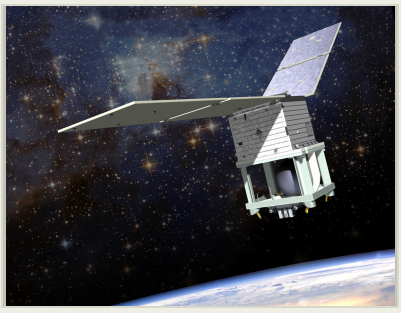
The mission is architected as a collaboration of NASA, Industry, and Air Force partners with the objective to advance the technology for propulsion components using AF-M315E green propellant. AF-M315E is a low toxicity, higher performance monopropellant formulation developed by the Air Force Research Laboratory and has the potential to increase the performance of propulsive vehicles, while reducing the costs and risks associated with propellant handling. The AF-M315E propulsion payload includes four 1N thrusters for attitude control and a single 1N thruster for primary thrust which will be flown on a standard Ball Aerospace BCP100 spacecraft bus.

Anticipated Benefits

The project's benefits will improve existing US green propulsion technologies with flight demo, enhance US in-space propulsion technologies and demo reduced propellant handling and loading hazards and costs

Primary U.S. Work Locations and Key Partners





Green Propellant Infusion Mission (GPIM)

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Organizations Performing Work	Role	Type	Location
Ball Aerospace & Technologies Corporation	Lead Organization	Industry	Boulder, Colorado
Aerojet Rocketdyne Holdings, Inc.	Supporting Organization	Industry	El Segundo, California
Air Force Research Laboratory(AFRL)	Supporting Organization	US Government	Notre Dame, Indiana
Air Force Space and Missile Systems Center	Supporting Organization	US Government	Kirtland AFB, New Mexico
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland
Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida

Primary U.S. Work Locations	
Alabama	California
Colorado	Florida
Maryland	New Mexico
Ohio	Washington

Project Transitions

October 2012: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Ball Aerospace & Technologies Corporation

Responsible Program:

Technology Demonstration Missions

Project Management

Program Director:

Trudy F Kortes

Program Manager:

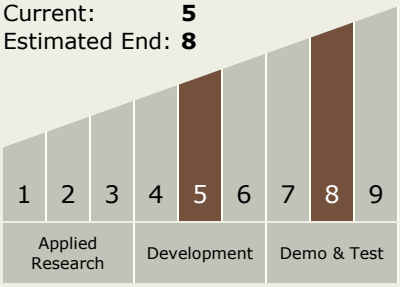
Tawnya P Laughinghouse

Principal Investigator:

Scott Tennant

Technology Maturity (TRL)

Start: **5**
Current: **5**
Estimated End: **8**



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October 2020: Closed out

Closeout Summary: The GPIM project provided a space-flight demonstration for an advanced, high-performance, non-toxic 'green' monopropellant. This technology promises higher performance for future satellites by providing options for longer mission durations, additional maneuverability, increased payload mass, and simplified launch processing. The green propellant for this mission was AF-M315E (renamed ACSENT), a hydroxylammonium nitrate (HAN) blend. During the GPIM project 1 N thrusters were developed by Aerojet Rocketdyne to a proto-flight level. A cross-cutting, nationwide team of NASA centers, DoD, and industry partners resolved the numerous technology challenges required for the flight program, providing a basis for the infusion of this technology. Three Space Experiment Review Board (SERB) payloads were incorporated onto the space vehicle measuring plasma density, space environments, and demonstrating advanced LEO position and velocity technology. A NASA STMD SBIR thermal control payload was incorporated on the space vehicle at no cost to the program. The flight program was tailored to maximize data from all payloads. The GPIM spacecraft, which was designed, manufactured, and acceptance tested by Ball Aerospace, was launched on 25 June of 2019 as a secondary payload on the Air Force STP-2 Falcon Heavy launch vehicle. GPIM completed all mission operations and reentered 13 October of 2020.

Closeout Link: https://www.nasa.gov/mission_pages/tdm/green/gpim-nears-completion.html

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.2 Earth Storable

Target Destinations

Earth, The Moon, Mars

Supported Mission Type

Push

Images

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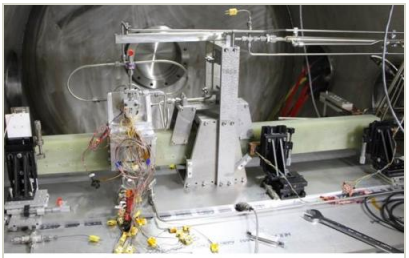
Green Propellant Infusion Mission (GPIM)
(https://techport.nasa.gov/image/100841)

Complete 1N EM thruster assembly

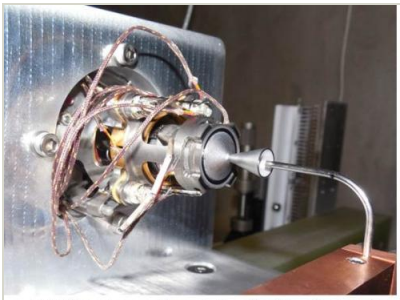
Complete 1N EM thruster assembly
Complete 1N EM thruster assembly
(https://techport.nasa.gov/image/100842)

GPIM 1N EM Thruster
GPIM 1N EM Thruster
(https://techport.nasa.gov/image/100844)



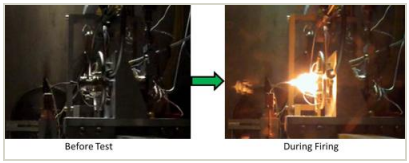
1N Thruster mounted on thrust stand

GPIM 1N Thruster mounted on thrust stand
GPIM 1N Thruster mounted on thrust stand
(https://techport.nasa.gov/image/100840)



1N Thruster on thrust stand with pitot probe

GPIM 1N Thruster on thrust stand with pitot probe
GPIM 1N Thruster on thrust stand with pitot probe
(https://techport.nasa.gov/image/100843)



GPIM Test
GPIM Test
(https://techport.nasa.gov/image/100839)

Links

Green Propellant Infusion Mission (GPIM)
(https://www.nasa.gov/mission_pages/tdm/green/index.html)

Project Website:

https://www.nasa.gov/mission_pages/tdm/main/index.html#.VQb6XUjJzyE